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## Unemployment and Midlife Suicide Rates in Australia 2001-2015: Implications During the COVID-19 Pandemic

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### Abstract

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# Unemployment and Midlife Suicide Rates in Australia, 2001-2015: Implications During the COVID-19 Pandemic

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## Abstract

The world is experiencing a massive economic shock from the COVID-19 pandemic. Resulting unemployment and socioeconomic disruption have the potential to lead to a major upswing in the population rate of suicide in Europe and elsewhere. We assessed the association between midlife suicide rates and unemployment for Australia. For the midlife group we found a rapid decrease in the rate from 1970s to 1980s, but a more apparent increase after 2007. The increased male suicide rate coincided with the 2008 global financial crisis. The relationship between worsening employment outcomes, including suicide, is a great tragedy and deserves urgent further investigation.

**Keywords:** Labour, Suicide, Socioeconomic, Regression, COVID-19

**JEL:** C230, E240, I100, J650

## 1. Introduction

One million people commit suicide globally each year. While there are likely to be broad secular factors underlying this, such as socioeconomic disadvantage associated with mental illness, many deaths from suicide should be preventable. (World Health Organisation, 2012; Mann, Apter, & Bertolote, 2005; Allen, Balfour, Bell, & Marmot, 2014) The fact that being unemployed increases the risk of a person taking their own life has long been recognised (Platt, 1984) and numerous studies have confirmed a link between unemployment and suicide. (Li, Page, Martin, & Taylor, 2011; Milner, Page, & LaMontagne, 2012)

The COVID-19 pandemic has caused a global economic shock with significant effects on labor markets across high- and low-and-middle income countries in Europe and Australasia. Spread of the pandemic has converged and interacted with three extant global crises that will have a profound effect on spread of the disease: governance, economics, and migration. These are independent crises with different roots, but reflect a challenge to mechanisms to produce and protect essential public goods for an effective policy response.(Bozorgmehr et al, 2020) European transnational governance systems to organise and administer public goods such as health-care support have been severely challenged. Many European countries are barely recovered from a decade of austerity following the 2007-08 financial crisis and likely will face spikes in unemployment. A report from the International Labour Organization (2020) highlighted that the impact on the labour market from the COVID-19 crisis is much more severe for the younger generation and adult females. Lastly, the migration crisis that began in 2015 has led to COVID outbreaks in under-resourced refugee facilities leading to health disasters.

Governments have taken different approaches to managing the economic crisis and resultant risk of increased unemployment. Relief strategies can be classified broadly according to the extent to which economic support is given directly to workers by a government agency (for example, as a benefit) or through a pre-existing employment relationship.(Rothwell, 2020) A number of European countries, and Australia, have attempted to prevent large scale unemployment by channelling relief through employers to their employees – subsidizing the workforce without severing ties with their employers.

Already there are reports of increased suicide rates in European countries.(Vantinen, 2020) For cultural reasons suicide receives less attention in Asian countries than in the West, and this has been associated with an underemphasis on suicide-related research and somewhat fragmented approaches to suicide prevention.(Chen, et al, 2012) The available data are very concerning: during the Asian Economic Crisis in 1999, “ suicide rates soared – 39% in Japan, 44% in Hong Kong and 45% in South Korea. Taiwan and Singapore, which were not as severely affected, showed no link between suicide rates and economic difficulties.”(Devitt, 2020)

There is continuing debate about the nature of the relationship between unemployment and suicide: is the association one of true causality or is the association confounded? Pre-existing mental illness predisposes both to unemployment and suicide and thus may be a confounder (Maki & Martikainen, 2012). Additionally, people with psychological problems are more likely to experience unemployment, further increasing the risk of mental illness and consequent suicide. (Allen et al. 2014; Shah, 2009; Frاسquilho, Matos, Salonna, Guerreiro, Storti, Gaspar, & Caldas-de-Almeida, 2016)

### *1.1 Theoretical context*

The theory of suicide proposed by Hamermesh and Soss (1974) proposes that an individual takes their own life when that person's remaining discounted lifetime utility falls below a certain threshold. In simple terms: the higher the expected income, the higher the expected utility making living more attractive than suicide. In the context of this theory, suicide then is a decision that a rational optimising agent makes based on the available evidence. Such a model, based on rational choice, would predict increasing suicide rates with increasing age. (Koo & Cox, 2008) Yet empirical data such as that of Neumayer (2004) found that, prior to 2000, the effect of unemployment on suicide was weakest in the age group 45 to 65 years, with the strongest effect in the age group 20 to 44 years. The question of whether a person who contemplates suicide truly is making a rational decision is an important one, and it is possible that suicidality is an irrational behaviour due to mental illness, loss of social capital, or social disintegration.(Jarosz, 1985; Helliwell, 2007) It is likely that unemployment increases the risk of suicide due to the loss of supportive resources, diminished social status, and increased relationship difficulties.(Chang & Chen, 2017)

The theoretical effect of unemployment on utility would suggest that labour market institutions – unemployment benefits and legislated employment protections – would have an effect on rates of suicide. Breuer and Rottman (2014) analysed a panel of 25 OECD countries, confirming the relationship between unemployment and suicide and showing that employment protections had a positive effect on suicide mortality. The latter is an important finding and has policy implications: that any interventions aimed at reducing suicide mortality should put emphasis on periods of economic recession; and, that economic and social supports for people facing unemployment should be balanced. By this, we mean that it is important to balance supports against the well-recognised association between ‘generous’ unemployment systems and the duration of unemployment – the macroeconomic literature finds that long-term unemployment tends to increase with rising unemployment benefits. (Blanchard & Wolfers, 2000)

## *1.2 Employment, well-being, and suicide*

Mental health is a key dimension in all of our lives, and an important predictor of wellbeing. Layard (2013) has reviewed wellbeing and its determinants, and found that happiness and ‘life satisfaction’ are strongly predicted by past mental health status, with an effect almost as strong as income and educational qualifications. Layard points out the ‘heavy economic costs’ and importance of mental health, calculating that the overall output loss is close to 7.5% of GDP in Britain, and concluding that, “of all this cost, more than half falls on the taxpayer and the rest on the individuals concerned and on their employers.”

Huikari and Korhonen (2016) contend that suicide statistics have a number of advantages over other methods of assessing ‘happiness,’ and agree with Daly and colleagues (2013) that, “suicide can be considered as a direct measure of an individual’s well-being. Further... suicide data measure more objectively well-being effects that, for example, survey data on self-reported well-being or self-reported health statistics.” Wellbeing is strongly related to macroeconomic conditions, and in the aftermath of the Global Financial Crisis (GFC) a number of papers have reported an increase in suicide rates in high-income countries. (Chen, Choi, Mori, Sawaka, & Sugano, 2012; Breuer & Rottman, 2014; Chang & Chen, 2015; Huikari & Korhonen, 2016; Blazquez-Fernandez, Cantarero-Prieto, & Pascual-Saez, 2017)

Anne Case and Angus Deaton (2015) investigated whether or not a relationship exists between suicide rates and self-reported well-being, and whether or not either metric is a useful indicator of overall societal well-being. Case and Deaton had sought a benchmark for self-reported well-being to understand if the measure has face validity, and speculated that suicide might be a measure of people’s unhappiness. They reasoned that, in regions of the United States where people self-report poorer well-being, the population rate of suicide would be higher. However, they found no such correlation despite rising suicide rates at a national level. Further analysis revealed that after many years of steady improvement, mortality rates among white non-Hispanic men and women had begun to increase. This finding was in contrast to data from other developed countries, where midlife mortality continued to reduce. (Case & Deaton, 2017) Case and Deaton found that mortality declines in cancer and heart disease had been offset by increases in the incidences of suicide, alcohol-related liver disease, and drug overdoses in the 45 to 54 year age group. They termed these causes of mortality ‘deaths of despair,’ and found that increases in their rates were large enough to offset other population-level longevity gains and cause an overall increase in midlife mortality, thus decreasing overall life expectancy in the United States. (Xu, Sherry, Murphy, & Arias, 2016)

Case and Deaton (2017) proposed that:

“Contemporaneous levels of resources – particularly slowly growing, stagnant, and even declining incomes – cannot provide a comprehensive explanation of poor mortality outcomes. We propose a preliminary but plausible story in which *cumulative disadvantage* from one birth cohort to the next – in

[labour] market, in marriage and child outcomes, and in health – is triggered by progressively worsening [labour] market opportunities at the time of entry for whites with low levels of education.”

Men of working age are particularly vulnerable to suicide with rising unemployment, and there is a strong association between unemployment and poor health. (Nordt, Warnke, Seifritz, & Kawohl, 2015) Unemployment has direct effects on individuals by mechanisms such as increased rates of depressive illness, financial strains, reduced access to mental health care, or disruption of existing treatments for depressive and other mental illness. (Classen & Dunn, 2012; Allen *et al.*, 2014) In a study spanning 2000 to 2011 and involving data from 63 countries, of four economic variables tested (national unemployment rate, GDP, growth rate, and inflation rate) only unemployment correlated with suicide rates at a national level. (Nordt *et al.*, 2015) The authors noted that the association was non-linear and somewhat time-lagged, and was stronger in countries with lower baseline unemployment rates than those with higher rates. The authors suggested that, “in countries where unemployment is uncommon, an unexpected rise in the unemployment rate might trigger greater fears and insecurity than in countries with higher pre-crisis unemployment rates.”

A study of the impact of unemployment variations on suicide in Western European countries – Austria, Finland, France, Germany, the Netherlands, Spain, Sweden, and the United Kingdom – during the period 2000 to 2010 (thus including the Global Financial Crisis) reported a ‘weak’ association between unemployment and suicide. (Laanani, Ghosn, Jougl, & Rey, 2014) The study found an increase of 0.3% in suicide rate was associated with each 10% increase in unemployment rate across Western Europe. However, the association only reached significance in three countries: the Netherlands, the United Kingdom, and France. In countries with high baseline unemployment rates, such as Spain, no association was found. The authors stated that while ‘economic crisis’ might impact on suicide rates, the relationship should not be considered ‘causal’ at the population level.

A study of longer duration and greater breadth, spanning the period 1960 to 2012 and including 30 countries – including Australia – examined national unemployment and suicide rates in two age groups: 20 to 64 years, and 65 years and older. (Norström & Grönqvist, 2015) The authors identified great heterogeneity between the countries, but reported that overall a 1% increase unemployment was associated with an increase of 0.06% in male suicide. The authors examined the welfare systems in place to provide ‘safety nets’ in each country. They attempted to rank the generosity of social welfare systems based on ‘the generosity of benefits paid to the unemployed, the qualifying period and conditions, duration of benefit payments, and the waiting period before entitlement is activated.’ (Bambra & Eikemo, 2009) The effect was strongest in eastern and southern European countries with the weakest unemployment protections. However, in countries with strong unemployment protection the association was weak.

A systematic review of the duration of unemployment reported that long-term unemployment is associated with a greater incidence of suicide, and that the risk is greatest in the first five years but is attenuated thereafter. (Milner, Page, & LaMontagne, 2013) This systematic review noted that there were marked variations in the methods of measurement of unemployment in different studies. In a follow-up review, the authors found that when pre-existing mental health status was controlled for, the relative risk for suicide in unemployment was reduced by one-third, thus confirming the assertion that mental health may be a confounder in many cases. (Milner, Page, & LaMontagne, 2013) Indeed, a meta-analysis has found an overall effect size of 0.51 for unemployment on mental health and concludes that unemployment not only correlates with psychological distress but also directly causes distress. (Paul & Moser, 2009) This meta-analysis also established that the effects of unemployment were stronger in countries with more adverse socioeconomic conditions such as lower levels of economic development, inequality, and lack of social welfare (Paul & Moser, 2009). Similarly, a recent systematic review of the effect of economic recessions on mental health has demonstrated that these periods are associated with a high prevalence of mental health problems and, ultimately, suicidal behaviour. (Frasquilho *et al.*, 2016)

A study of unemployment alone examined national data from Australia during the period 1985 to 2006, using cross-sectional data regarding unemployment at a national level and suicide rates (Milner, Page, & LaMontagne, 2012). The authors reported the paradoxical finding that over the study period increasing unemployment at a national level was associated with lower male suicide rates. They also found that when unemployment was decreasing, and during periods when unemployment was of longer duration, male suicide rates increased. Only a weak association was found between suicide and unemployment in men aged 44 to 54 years, and no relationship to female suicide rates was reported. These findings contrast with those of Case and Deaton (2015, 2017) and now are no longer contemporaneous to the findings from the United States. Responding to a gap in the literature, this paper assesses the association between midlife suicide rates and unemployment rates at the regional level by sex, using regional level suicide data for Australia.

## 2. Methods

The Australian Bureau of Statistics (ABS) compiles national data on all suicide deaths in Australia, and a full explanation of ABS data management can be found at the organisation's website (ABS, 2019). These data are obtained from the state and territory Registrars of Births, Deaths and Marriages, and the notifications are supplemented by information from the National Coroners Information System (NCIS). The management of the death registration systems is the responsibility of each of the eight individual state and territory Registrars. As part of the registration process, information about the cause of death is supplied by the medical practitioner certifying the death, or by a coroner. Other information about the deceased is supplied by a relative or other person acquainted with the deceased, or by an official of the institution where the death occurred.

The ABS uses the *International Classification of Diseases – Version 10 (ICD-10)* for coding of cause of death in Australia. Deaths from external causes are coded according to the mechanism (how a person died) and the intent (whether the death was accidental, a homicide, or from intentional self-harm including likely suicide). Coronial investigations into potential suicide deaths are often complex, with considerable challenges associated with the determination of intent. Thus, coronial findings for some deaths are not available when ABS coding is finalised for a particular reference period – this affects approximately 40% of coronial cases when preliminary coding is completed.

This issue with data quality is addressed by the ABS in two ways. In the first instance, by increasing the length of time from the end of the reference period to publication of data to 15 months allowing more time to receive information on coroner certified deaths. Secondly, by introducing new coding guidelines and a process of revisions to Causes of Death data. The new coding guidelines improve data quality by enabling deaths to be coded to suicide if evidence indicates the death was from intentional self-harm. Previously, coding rules required a coroner to determine a death as intentional self-harm for it to be coded to suicide. However, in some instances the coroner does not make a finding on intent. The reasons for this may include legislative or regulatory barriers around the requirement to determine intent, or sensitivity to the feelings, cultural practices and religious beliefs of the family of the deceased. Furthermore, for some mechanisms of death it may be very difficult to determine suicidal intent (e.g. single vehicle incidents, drowning). In these cases, the burden of proof required for the coroner to establish that the death was as a result of intentional self-harm may make a finding of suicide less likely.

Under the new coding guidelines, in addition to coroner-determined suicides, deaths may also be coded to suicide following further investigation of information on the NCIS. Further investigation of a death would be initiated when the mechanism of death indicates a possible suicide and the coroner does not specifically state the intent as accidental or homicidal. Information that would support a determination of suicide includes indications by the person that they intended to take their own life, the presence of a suicide note, or knowledge of previous suicide attempts. In addition to the new coding guidelines, a revisions process has been applied to all cases



registered after 1 January 2006 to improve the quality of the *Causes of Death* collection over time. This revisions process enables coders to re-examine coroner certified deaths either 12 or 24 months after initial processing. Over this time many coronial investigations are finalised. Once coroners have made their determination of the underlying cause of death, the ABS is able to code the death more accurately. If the case remains open on the NCIS, ABS will investigate and use additional information from police reports, toxicology reports, autopsy reports and coroners' initial findings to assign a more specific cause of death where possible.

The revisions process was internally assessed by the ABS in 2010 when the first year of applicable data, that for the 2007 reference period, had completed the full revisions cycle. This assessment found that over the two years of revisions, 16% of deaths which were referred to a coroner were recoded to more specific ICD-10 codes than those initially assigned. Analysis showed a decrease in cases coded to non-specific causes (e.g. Events of undetermined intent (Y10-34, Y87.2) and Other ill-defined and unspecified causes of mortality (R99)) and increases primarily in external causes of mortality, including suicide.

Noting these data quality issues, we were obtained a custom dataset from the ABS detailing the number of deaths in the five largest states of Australia (New South Wales, Victoria, Queensland, South Australia, and Western Australia) for the period 2001 to 2015 inclusive, separated for rural and suburban areas. The data were provided in Excel™ format: the dataset included the number of deaths coded as suicide by age group and sex. As a dominator, we obtained yearly point estimates of the population in the states for age and sex.

Unemployment estimates were obtained from the Australian Bureau of Statistics (catalogue no. 6291.0.55.001, Labour Force, Australia). The ABS dataset provides estimates of unemployment rate over time, and separates rates of unemployment into greater capital city area and for the rest of the state (that is, regional areas).

We used a linear mixed model approach to determine the strength of association between regional unemployment and suicide rates. Recognising the temporal dependency within region, we fitted the year within each region as a random model, and fitted the type of area (rural and suburban) and regional unemployment rate as fixed model. The model coefficient for the unemployment rate indicates how the unemployment rate relates to the suicide rate, and the P value indicates the level of significance of this association. This study received prospective ethics approval from the Australian National University Human Research Ethics Committee (protocol 2015/347).

### 3. Results

In the first instance historical data on the suicide rates and unemployment rate were used. **Figures 1 to 20** show the regional historical suicide rates in males and females for: (1) the 40 to 60 years (midlife) age group; and, (2) for all other age groups plotted with the unemployment rates over the study period.

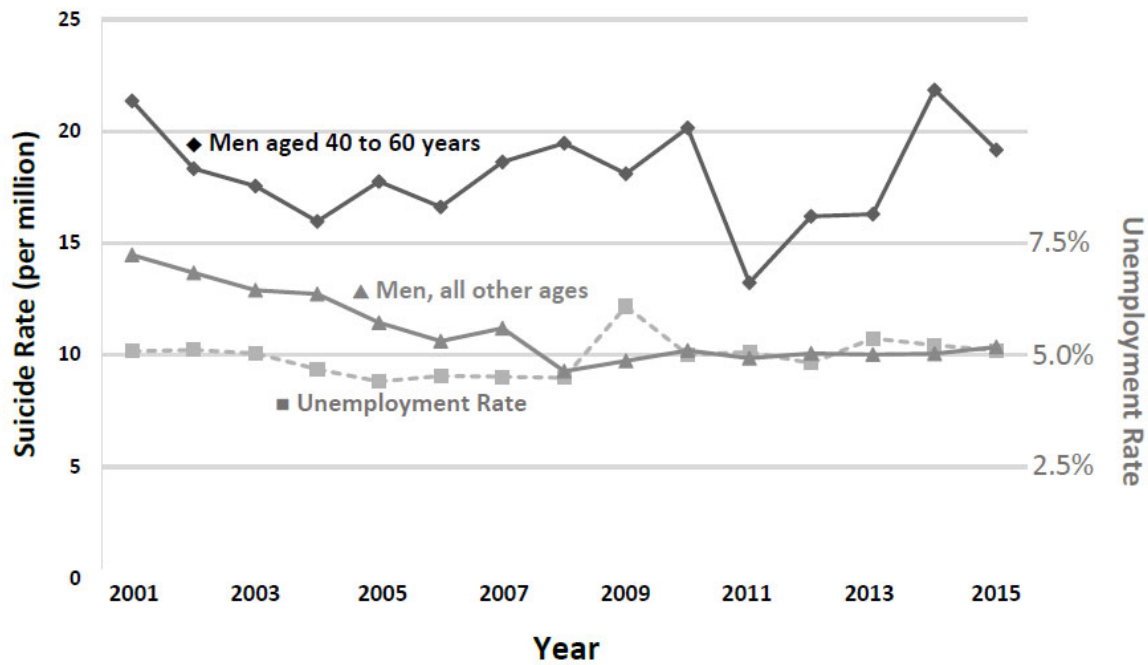


Figure 1. Sydney metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

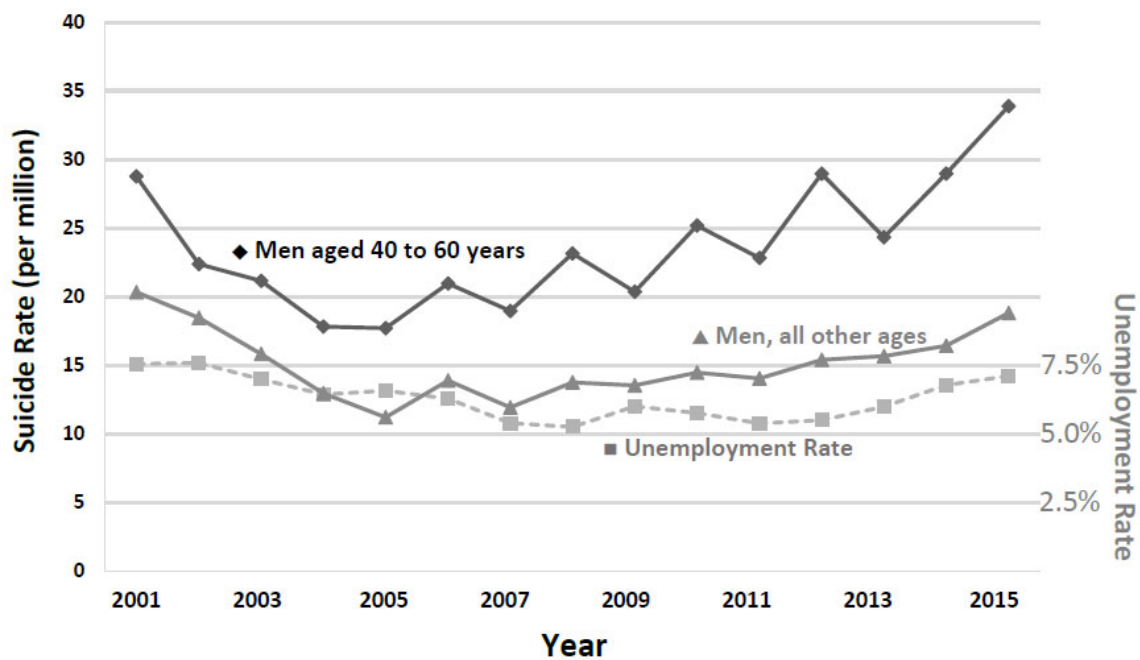


Figure 2. New South Wales excluding Sydney metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

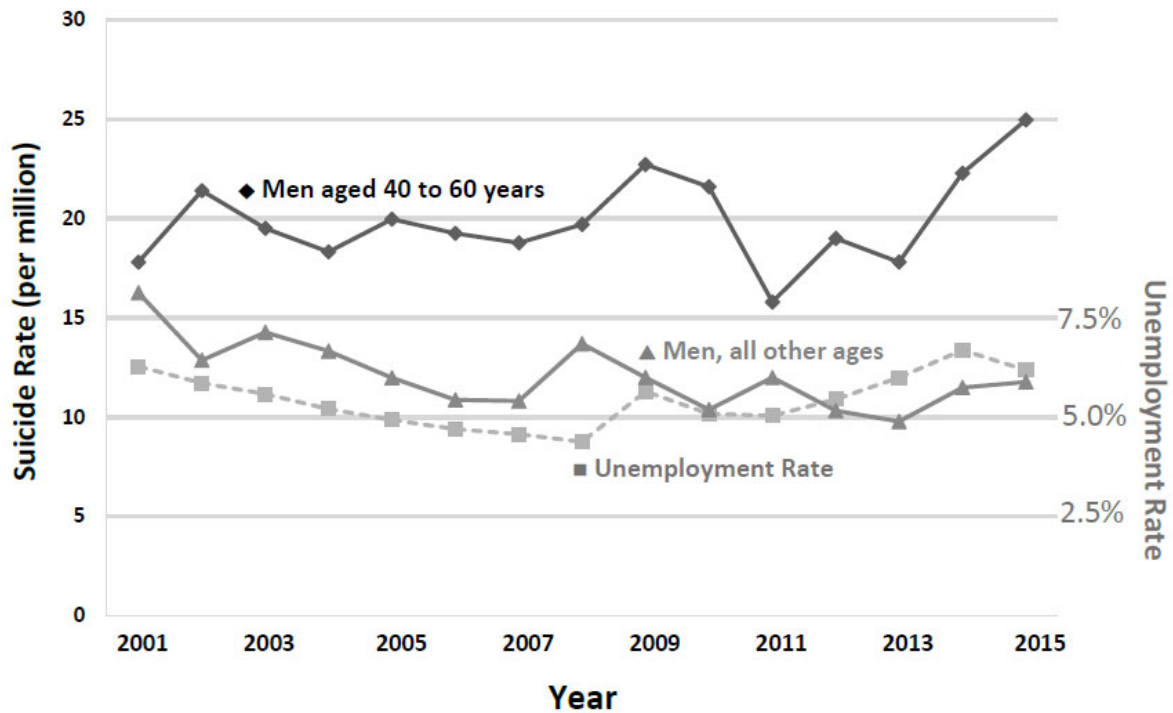


Figure 3. Melbourne metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

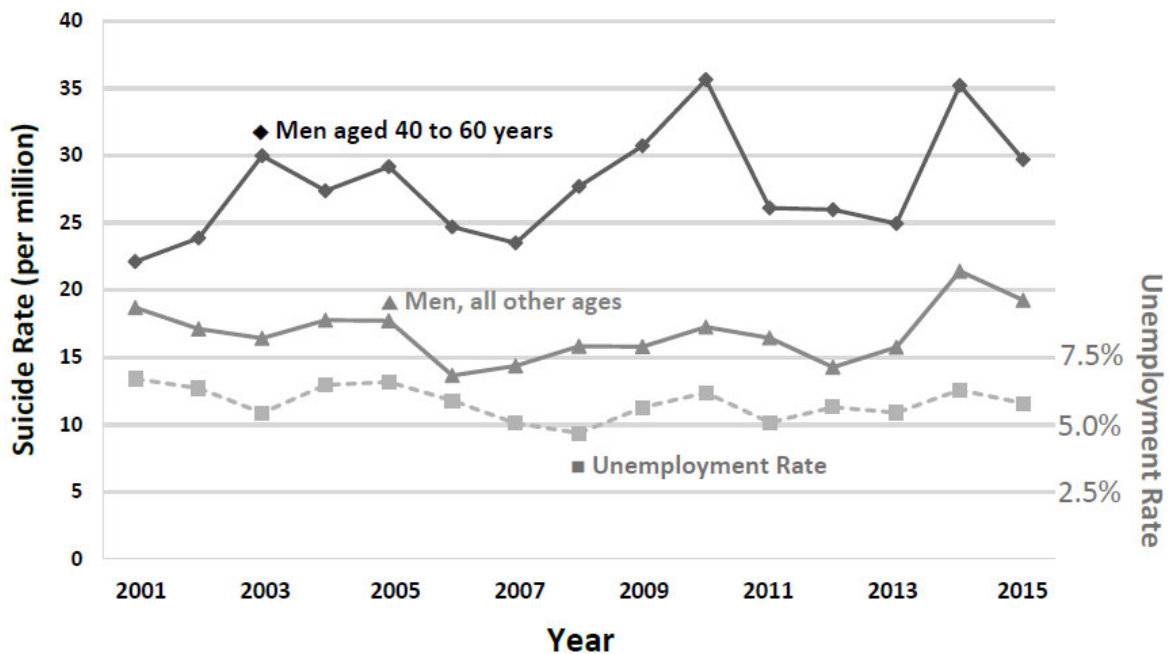


Figure 4. Victoria excluding Melbourne metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

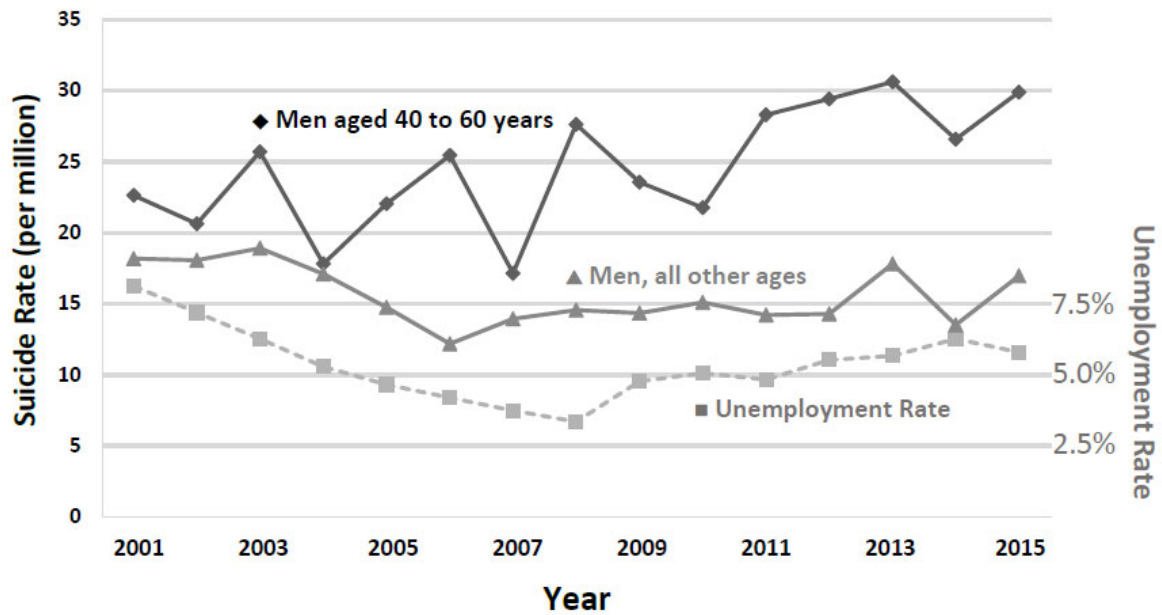


Figure 5. Brisbane metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

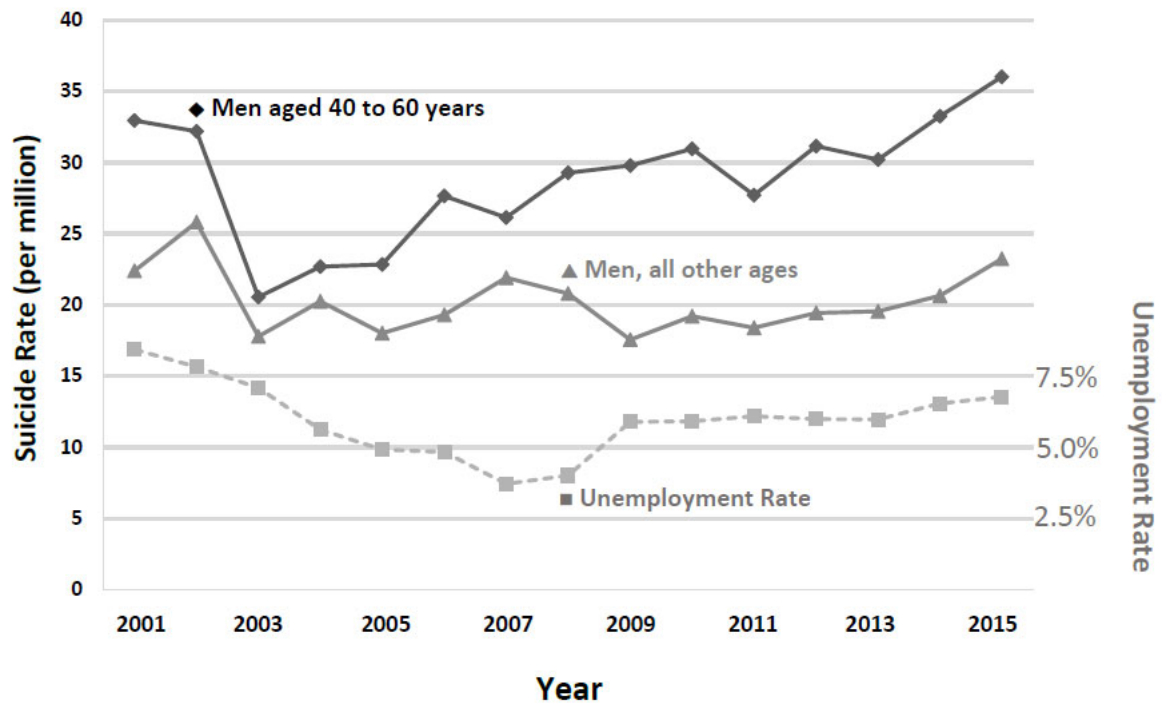


Figure 6. Queensland excluding Brisbane metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

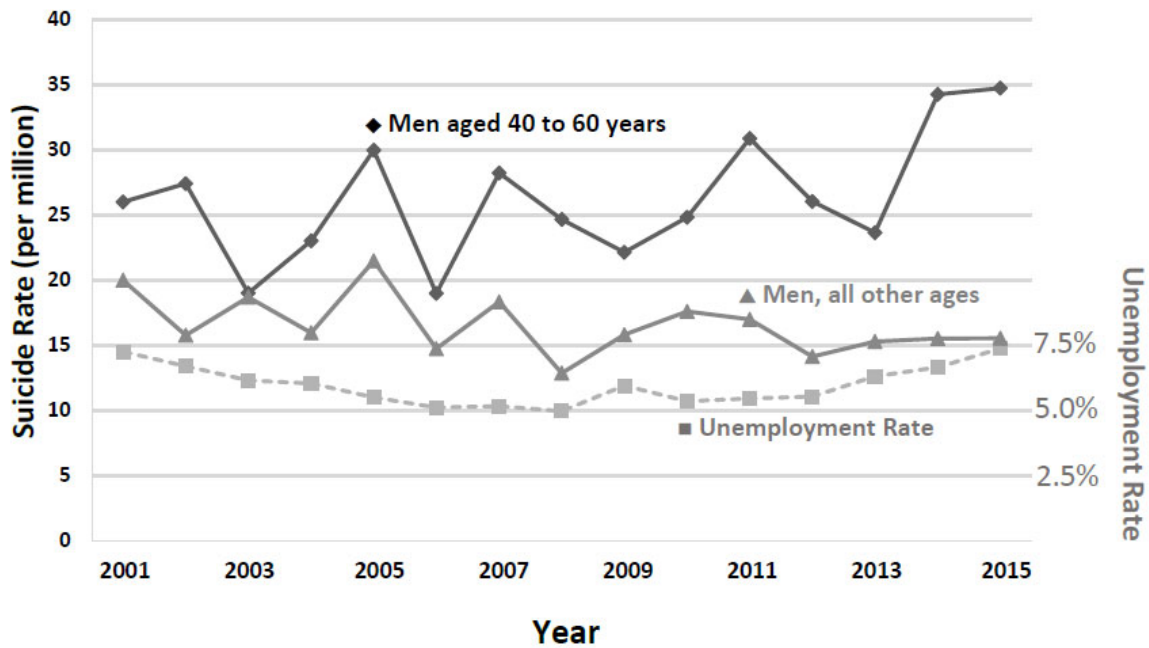


Figure 7. Adelaide metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

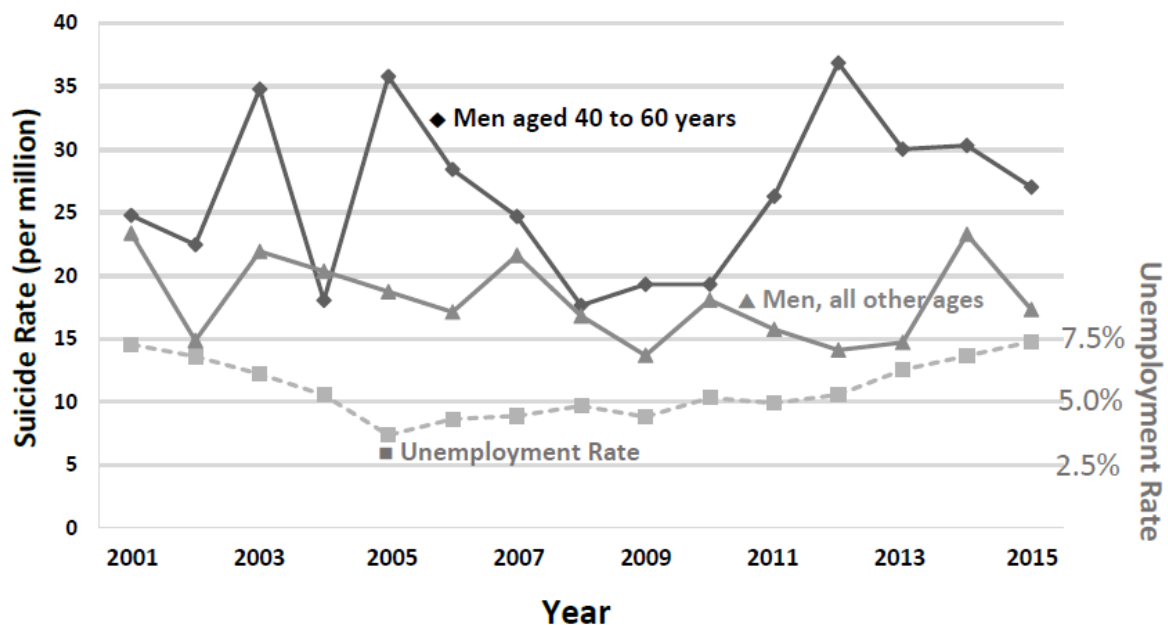


Figure 8. South Australia excluding Adelaide metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

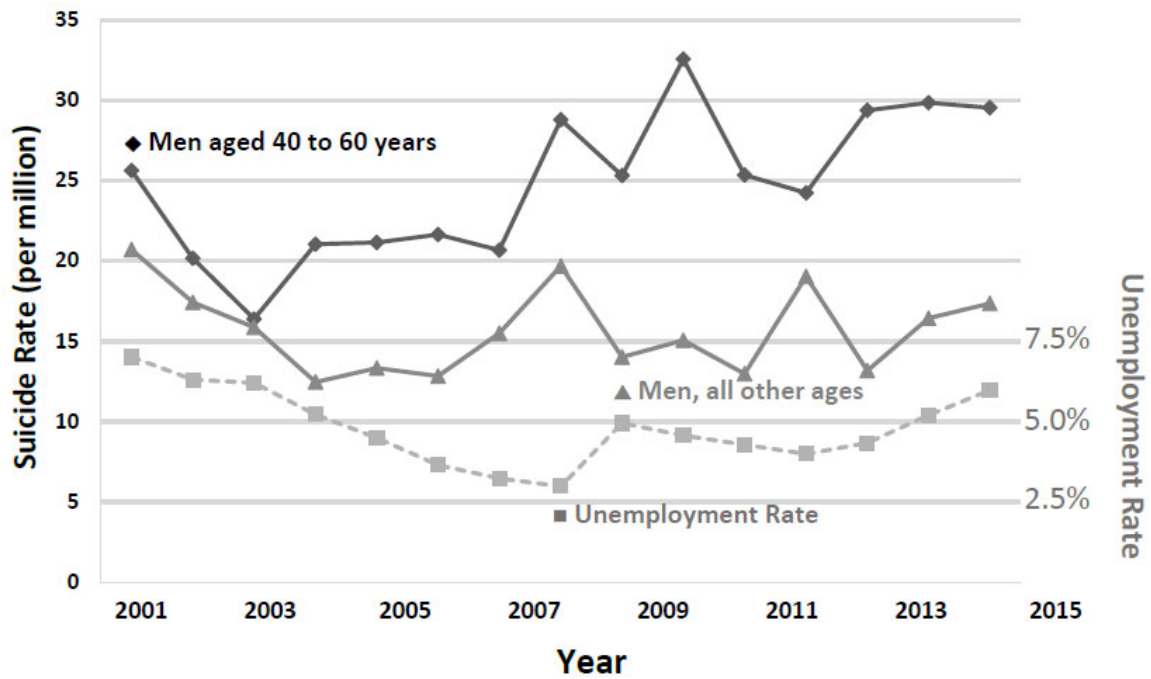


Figure 9. Perth metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

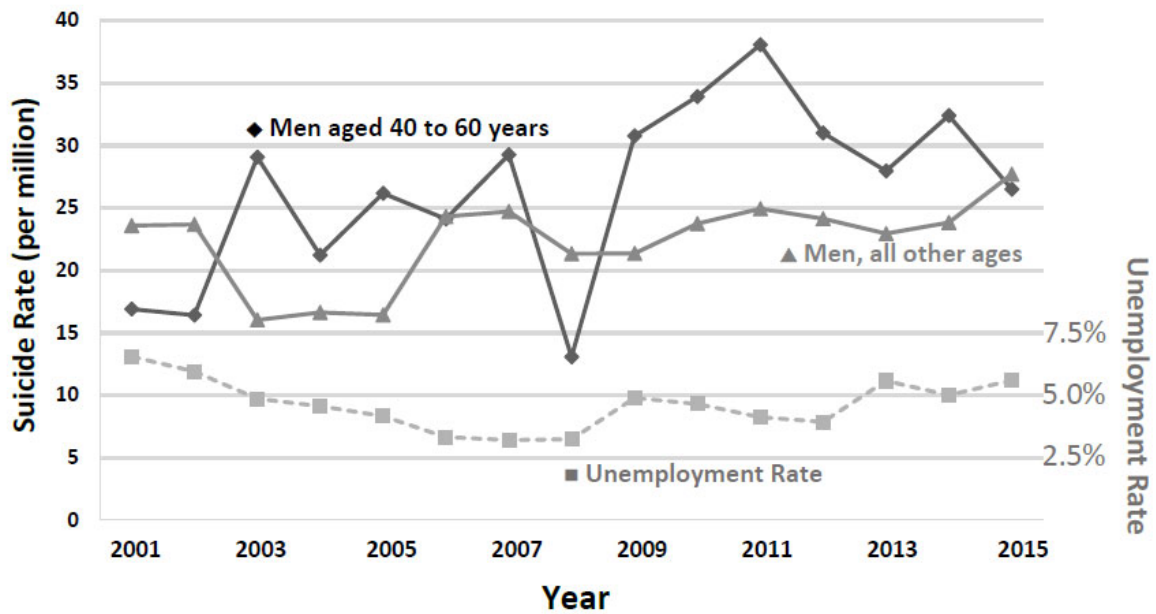


Figure 10. Western Australia excluding Perth metropolitan area: yearly male suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

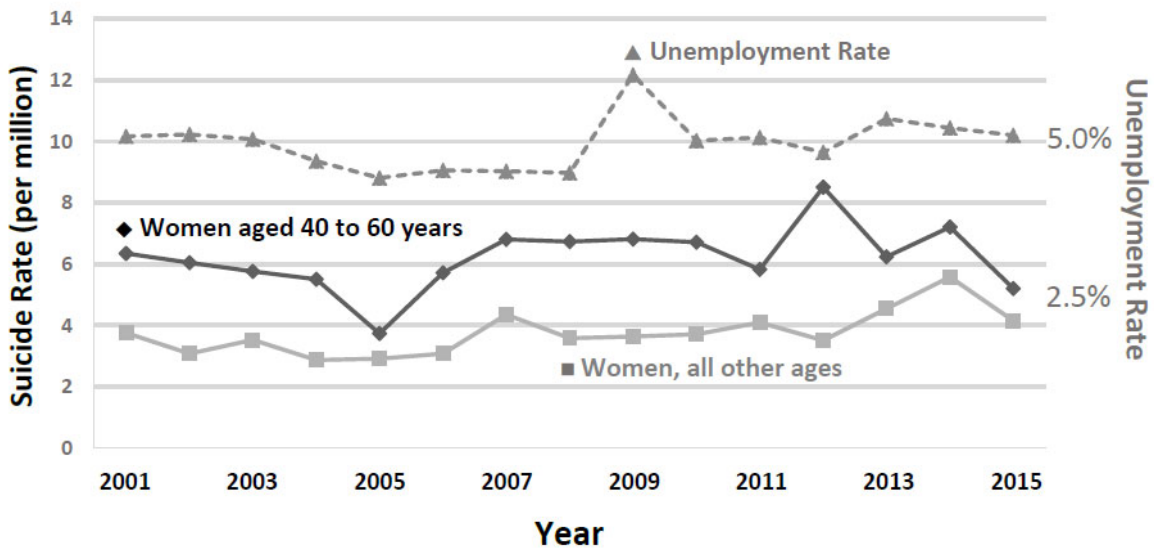


Figure 11. Sydney metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

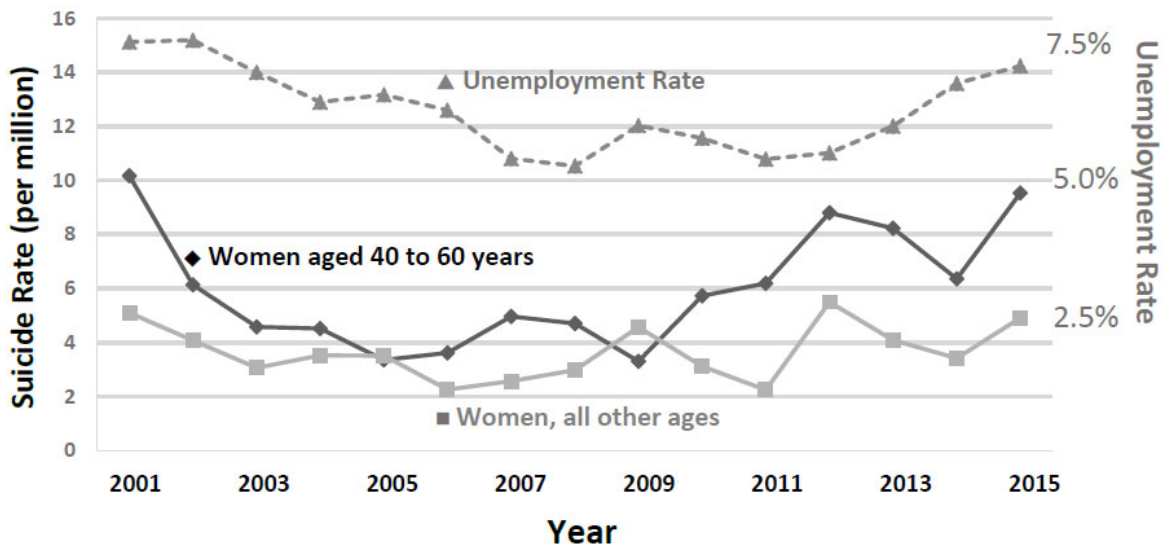


Figure 12. New South Wales excluding Sydney metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.



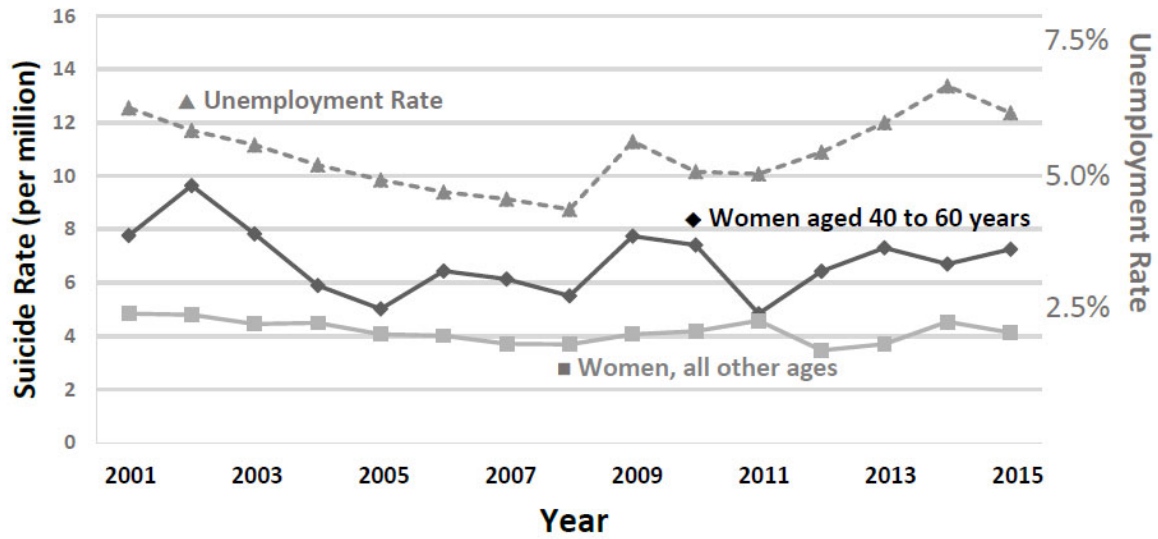


Figure 13. Melbourne metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

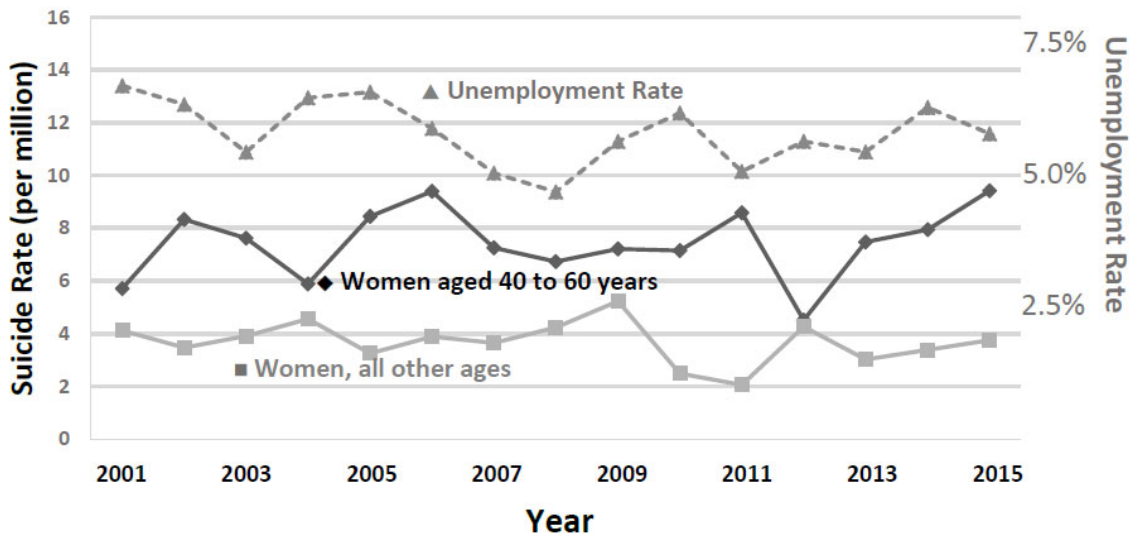


Figure 14. Victoria excluding Melbourne metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.



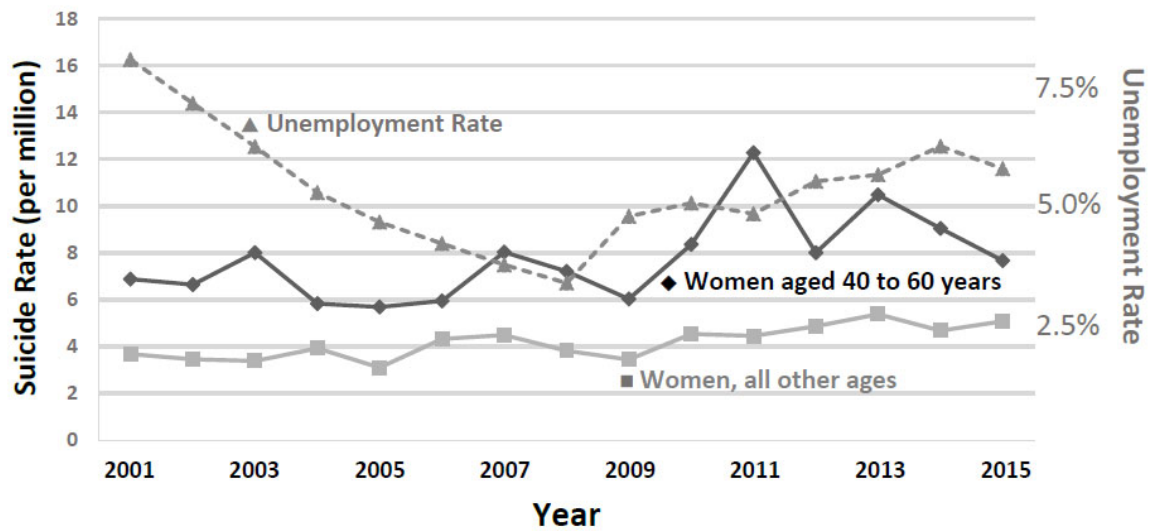


Figure 15. Brisbane metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

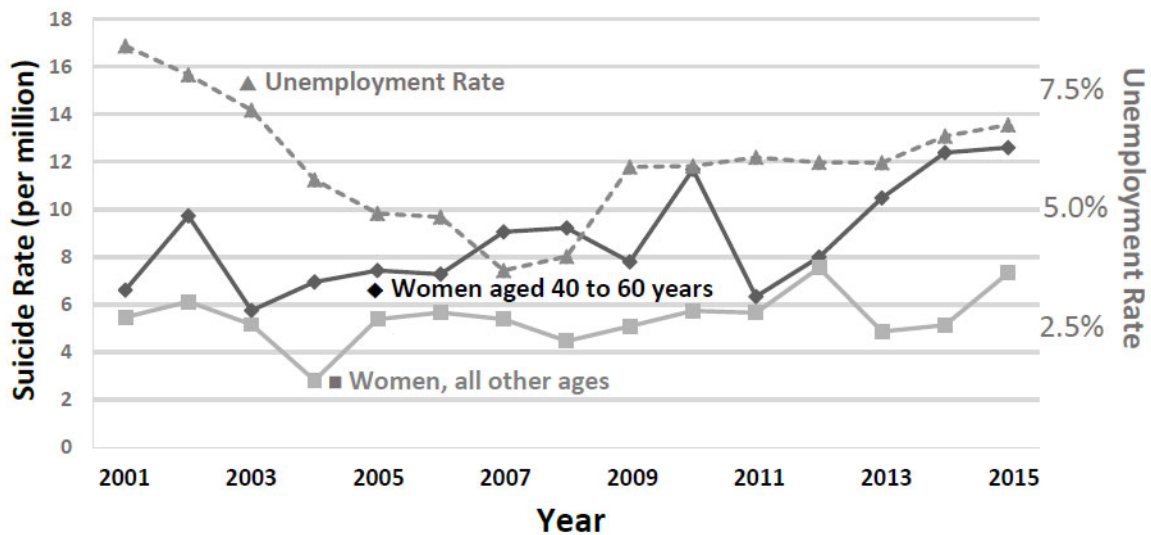


Figure 16. Queensland excluding Brisbane metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

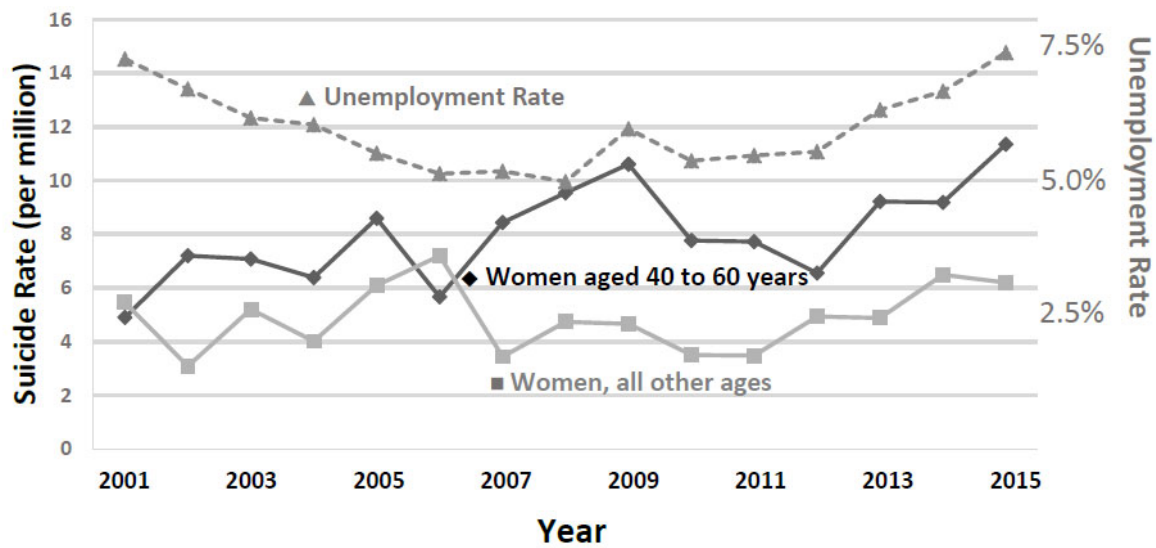


Figure 17. Adelaide metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

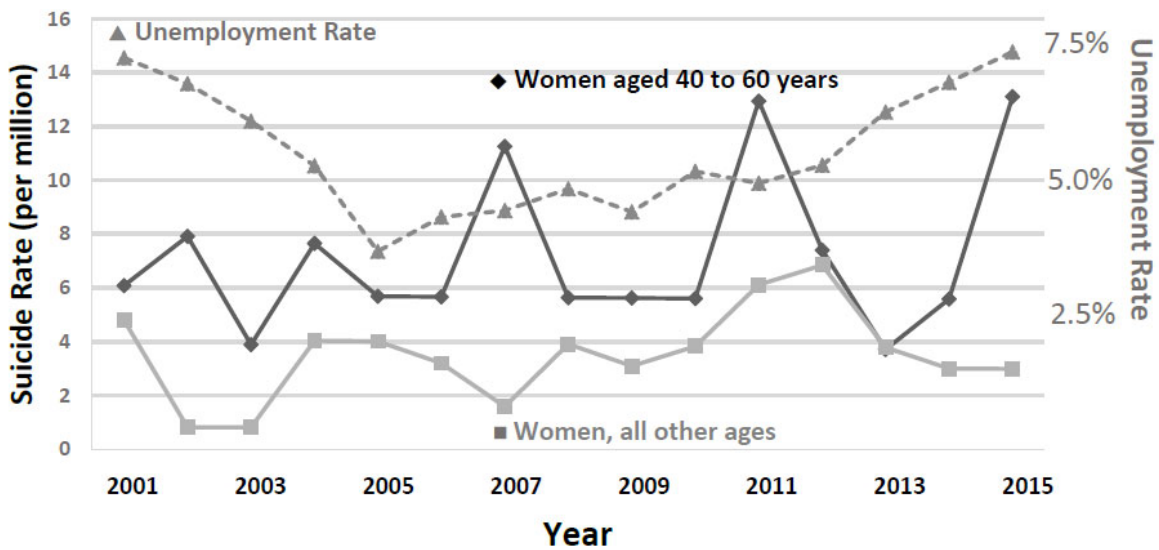


Figure 18. South Australia excluding Adelaide metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

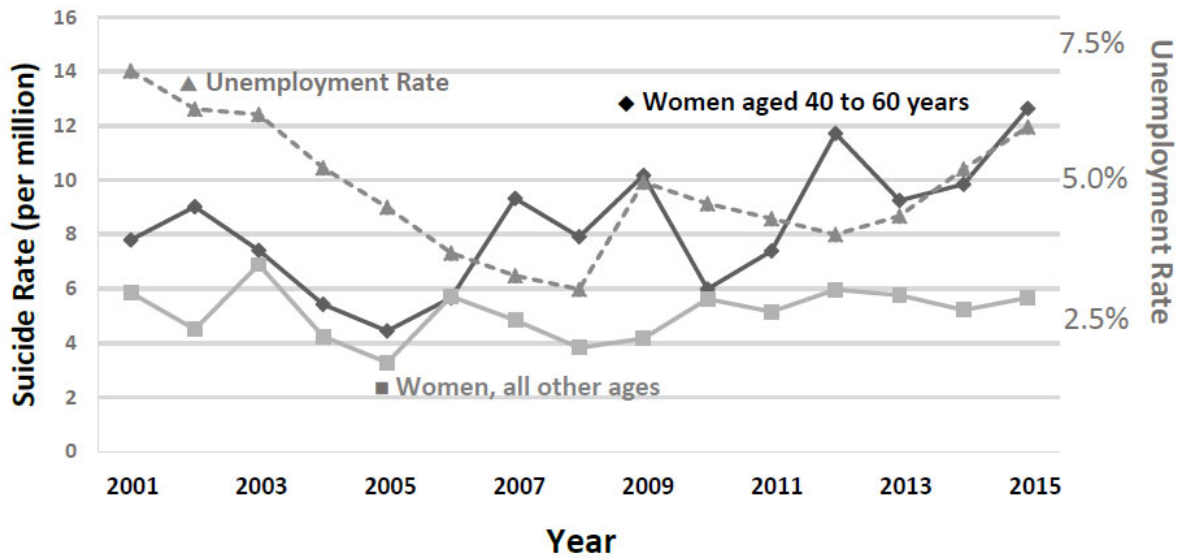


Figure 19. Perth metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

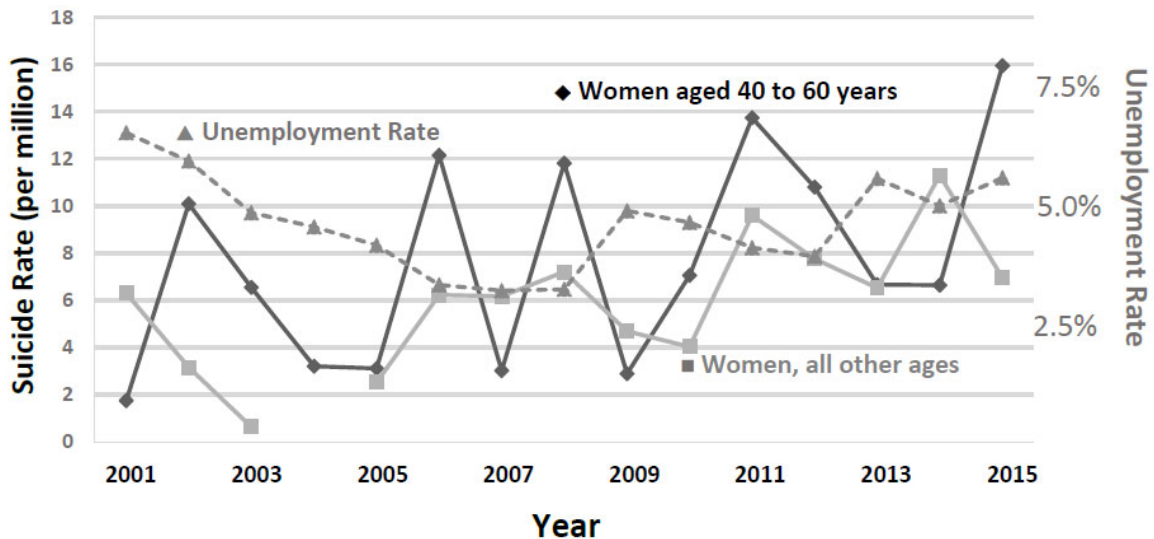


Figure 20. Western Australia excluding Perth metropolitan area: yearly female suicide rate (deaths per million) in two age bands (40 to 60 years; and, all other ages) plotted against average unemployment rate (%), 2001 to 2015 inclusive.

Overall, males had a higher suicide rate than females but the general trend of suicide rate between genders was consistent: this suggests that males and females were exposed to the same influential factors for suicide. While the suicide rates for all other ages remained relatively stable, both male and female midlife age groups showed a large fluctuation after 2009 when the global financial crisis occurred. The unemployment rate reflected the regional financial situation, showing an increase after 2009.

#### 4. Discussion

The analysis revealed the relationship between the midlife suicide rates and the unemployment rates from two perspectives: one confirmed the association between financial stress and suicide rates suggested by the trend in the Australian historical data and the other literature; secondly, the midlife age group experienced a larger fluctuation than other age groups, especially in men. This prompted a secondary *post hoc* question: “is midlife suicide more sensitive to changes of financial situation than the other age group?” We conducted an in-depth analysis to study the marginal effect of financial stress to the midlife group. Results including the coefficients and p-values are shown in **Table 1**.

Table 1. Regression coefficients and significant values for unemployment rates from the mixed models for the historical suicide rates and the marginal suicide rates

Response	Gender	Coefficients	d.f.	P values
Suicide rate for 40-60 group	Male	0.85	1	0.016*
	Female	0.25	1	0.167
Marginal suicide rate for 40-60 group <sup>1</sup>	Male	-0.01	1	0.513
	Female	0.02	1	0.815

<sup>1</sup>Marginal suicide rate is the ratio of suicide rates for the mid-life group compared to all other ages

To understand the direct association between suicide rates and unemployment rates for the midlife group, we used the suicide rates for the midlife age group as the response variable and the regional unemployment rates as the explanatory variable, conditional on the type of the region (rural or suburban). The first two rows in Table 1 show that midlife male suicide rate was positively associated with regional unemployment rates with a p-value of 0.016, while the female suicide rate did not show significant association with unemployment.

To understand the more in-depth marginal effect of financial stress on the midlife group, we studied the ratio of suicide rates for the mid-life group to all other ages. The ratio used the suicide rates of all other age groups as a baseline, and measured the margin of suicide rate for the midlife group, accounting for the underlying communal factor affecting suicide rates across all age groups at a given time period (for example, health and help facilities, intervention campaigns, etc). This enabled us to answer the question “is the midlife group prone to financial stress than other age groups?” The third and fourth rows in Table 1 show the association between the marginal suicide rates and the unemployment rates. Neither gender showed significant marginal association between financial stress and midlife suicide rate, which suggested that the middle age group is no more susceptible to suicide due to financial downturn than other age groups. The detailed implications of this result will be given in the next section.

Our study suggests that unemployment and suicide are closely linked, with a higher suicide rate and a larger fluctuation in midlife, a finding consistent with Case and Deaton (2015, 2017). The association is significant for male midlife suicide, but not with female midlife suicide, a finding consistent with Milner and colleagues’ findings (2012). However, the unemployment rate does not explain the volatility directly since the midlife group is no more sensitive/vulnerable to change in financial situation than the general population.

#### 5. Conclusion

We have assessed the association between midlife suicide rates and unemployment rates at the regional level in Australia and found that, for the midlife group, there was a rapid decrease in the rate from 1970s to 1980s. However, there has been increase in midlife male suicide rate associated with the 2008 global financial crisis,

suggesting a link between financial stress and suicide rates. Taking regional unemployment rates as proxy indicator for economic uncertainty faced by individuals, we found suicide rates were positively associated with higher unemployment rates in midlife males but not in females. Rural areas showed a stronger association between the unemployment rate and the suicide rate than urban areas. Suicide is important from many perspectives. The loss of workers has a long-term effect on productivity, both in terms of workforce participation but also in consumption. Suicide represents the endpoint of a spectrum of poor mental health and wellbeing status, imparting a substantial burden with measurable effect GDP. On a personal level, it has profound effects families and communities, workplaces, and social networks. As Denney and colleagues (2009) frame it, “suicide is shaped by social forces, and unlike many causes of death, it does not result directly from degenerative disease or old age. The risk of suicide increases as individuals reach a point of disillusion or disconnect from the world around them.”

Australia’s industry structure has gone through fundamental changes in recent decades. A quarter of a century ago manufacturing was the largest employing industry in Australia. Today, it is the sixth largest and accounts for 7% of total employment. The decline of manufacturing has been caused by many factors, including technology and increased competition from overseas manufacturers. A recent narrative review has highlighted the impact of specific factory closures may have - such has been the case with the recent shuttering of the Australian automotive manufacture industry - leading to psychological distress, increased self-harm and suicide rates. (Myles, Large, Myles, Adams, Liu, & Galletly, 2017) Nonetheless, technology appears to be playing a large role in making certain jobs obsolete, while promoting other forms of employment. In particular workers who do routine, codifiable tasks are at risk of losing their jobs in the coming years with new industrial Taylorism.

Among the effects of the COVID-19 pandemic globally, it seems likely that spikes in unemployment may be associated with increasing rates of suicide in prime-aged members of the workforce on a global scale. The relationship between worsening employment, its consequences and adverse health impacts, including suicide, is a great tragedy that deserves further investigation. Determining the contributing and indeed, confounding, factors will assist in the evidence-based consideration of possible interventions for the impacts of unemployment on mental health and suicide. The time has come to drive back despair.

## Disclosures

Nil to declare

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